State of California
The Resources Agency
Department of Fish and Game

RECOVERY STRATEGY FOR CALIFORNIA COHO SALMON

Report to the California Fish and Game Commission

Prepared by
The California Department of Fish and Game

Species Recovery Plan Report 2003-1

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8 Shasta-Scott Pilot Program

In accordance with the direction of the Commission, the Department established a Pilot Program to address coho salmon recovery issues associated with agriculture and agricultural water use in the Shasta Valley HA (Figure 7-5) and the Scott River HA (Figure 7-6), and established the Shasta-Scott Coho Recovery Team (SSRT) to advise the Department on these issues. All other issues within these two watersheds were addressed by the CRT. Both the SSRT and CRT aided the Department in the development of the Pilot Program (see Section 7.2.5).

8.1 FRAMEWORK FOR AGRICULTURAL ISSUES

The SSRT has reached preliminary agreement on the recommendations included in the Pilot Program. The SSRT intends to consider the recommendations in another round of review and to establish the framework for an implementation and permitting strategy (including Streambed Alteration Agreements and Incidental Take Permits) before finalizing the recommendations.

Recommendations addressing agriculture and agricultural water use in the Shasta and Scott river valleys were developed in eight action categories. Recommendations for implementation and administration are introduced in Section 8.3; they will be more fully developed later. Recommendations for the following seven categories are presented in Section 8.2:

1. Water Management. Recommendations in this category include the following topics: preparation of a Dry Year Water Plan, verification of water use and water rights, ramped flows for diversions, pulse flows, interim instream flows, irrigation rotation, installation and maintenance of headgates and measuring devices for diversions, better water forecasting, groundwater studies, and instream flow/habitat/temperature modeling studies.

2. Water Augmentation. Recommendation topics are: formation of water trusts, development of additional surface water storage, small storage opportunities, conjunctive groundwater use, conveyance from the main Klamath, as well as buying or leasing water rights.

3. Habitat Management. These recommendations are presented separately for the two watersheds.

    a. Scott River. Recommendations for habitat management focus on improvement of: rearing habitat (habitat restoration, flow connectivity, temperature); valley and low-

gradient tributary channel structure and function; fish passage (low flow, structures at private road crossings, remediation of mine tailings); and spawning gravels.

b. Shasta Valley. Recommendations address: rearing habitat (identification of current rearing habitat and efforts to maintain it; enhancement of rearing habitat; identification and remediation of various dams and impoundments, high temperatures, and structures at road crossings that are barriers to fish passage); management of spawning gravel; management of riparian vegetation; and water temperatures.

4. Water Use Efficiency. Topics in this category include development of alternative stock water systems, workshops in water use efficiency for landowners, ditch lining and piping, ditch repair and cleaning, irrigation system efficiency, cropping changes, tailwater reclamation, Best Management Practices, and implementing the CIMIS program (California Irrigation Management Information System) in the two watersheds.

5. Protection. This category includes screening diversions and screen maintenance, protection of riparian zones, fish rescue, and barrier removal.

6. Assessment and Monitoring. The recommendations are presented in two categories: habitat monitoring and fish population monitoring. The goals are to collect data that will be needed for both the federal and state recovery programs as they evaluate progress toward recovery and to support an adaptive management program for the measures in the other categories. One key issue is obtaining access from landowners.

7. Education and Outreach. Education efforts will target not only landowners, but also legislators (federal, state, and local), and local schools. Handbooks, newsletters, a website, active engagement with the local press, demonstration projects, and special events are proposed.

8.2 SHASTA-SCOTT PILOT PROGRAM RECOMMENDATIONS

The recommendations developed by the SSRT[1] to deal with agricultural water and land use issues are presented in eight solution categories: water management, water augmentation, habitat management, water use efficiency, protection, assessment and monitoring, education and outreach, and administration and implementation. Short issue and solution statements that provide context are provided within the list of recommendations.

8.2.1 WATER MANAGEMENT RECOMMENDATIONS

Low instream flows are the major issue discussed here in eleven sub-categories.

[1] The SSRT has reached preliminary agreement (termed “preliminary favorable regard”) on the recommendations within the first seven action areas. This is a status short of “final approval.” The team needs additional time to consider how the Pilot Program will be implemented before it can give its final approval. If an extension of the plan development period is granted by the Commission, the SSRT intends to pursue the establishment of an implementation and permitting framework necessary to allow their final approval of the recommendations.

8.2.1.1 Dry Year Water Plan

Issues: Low instream flows, especially in drought and dry years, limit habitat for coho salmon and other salmonids. Currently, there are no comprehensive plans to deal with supplying instream flows for coho salmon.

Solutions: Develop a comprehensive, community-based plan that identifies progressive steps to take to obtain, manage, or deal with low water conditions in advance of the event.

WM-1a Ask Scott River Watershed Council (SRWC) to develop an emergency water plan for the Scott. Components would include predetermined funding and prioritized actions for implementation, with identification of who, what, where, when, and how.
Short-term: Seek funding and proceed with plan development.
Long-term: Use plan to coordinate actions during low-water periods. Plan will define "low-water."

WM-1b Ask the Shasta CRMP to develop a Dry Year Water Plan for the Shasta. Components would include predetermined funding and prioritized actions for implementation, with identification of who, what, where, when, and how.
Short-term: Seek funding and proceed with plan development.
Long-term: Use plan to coordinate actions during low-water periods. Plan will define "low-water."

8.2.1.2 Verification of Water Diversions with Water Rights

Issues: Currently the Shasta River and five creeks in the Scott Watershed are under State Watermaster Service. The main Scott River and other tributaries, while under decree, are not under either State or private watermaster service. Watermasters allocate and manage water diversions so that each diverter receives water according to his or her right as defined in the decree. In the non-watermastered areas, diverters may not be diverting their correct allotment and there is no verification that diverters are correctly following their adjudicated right. If diverters are taking more than their right, it may be impacting instream flows, coho salmon habitat, and other water-right holders.

Solutions: Careful management and verification of diversion amounts according to existing decrees may increase flows. Recent DWR efforts to more precisely manage diversions on the watermastered streams have produced prolonged higher instream flows in the summer season. Watermasters also are able to manage volunteered or dedicated instream flows.

WM-2a Add additional oversight and provide more people to verify water use and better manage water in current watermaster service areas (Shasta and Scott).
Short-term: Seek and support additional funding and authorization to add one additional person to work in the area already watermastered by DWR.

Include verification data in the annual report.
Long-term: On-going

WM-2b Work with diverters covered by the Scott River Decree to confirm they know exactly their rights.
Short-term: Hold voluntary one-on-one meetings with diverters and conduct a diverters' workshop for each schedule.
Long-term: Continue periodic diverters' workshops.

WM-2c Provide assistance for voluntary flow measurement of current non-watermastered diversions on the Scott.
Short-term: DWR staff can continue to provide service as needed. DWR can train others (SRWC, RCD staff) on flow measuring techniques.
Long-term: Continue to provide service and training as needed.

WM-2d Verify compliance with water rights as contained in the Scott River Decree using a phased implementation period for currently un-watermastered areas. 100 percent verification is the goal.

Short-term: The following steps will be taken to ensure verification.

1. During 2003 and early 2004, diverters on a given reach will choose to have usage verified under one of the following options:
    a. Independent and accountable private watermaster, who coordinates with DWR;
    b. Allow DWR to access sites for compliance (individual);
    c. Watermaster by DWR with no fee; or
    d. Other mechanisms to be determined.
2. After 7/1/04, DWR will assess and report on the adequacy of the verification efforts. If sufficient, continue. If not sufficient (not enough volunteers or inadequate results), solicit water users for adoption of Watermaster Service. (15% of the diverters within the decree can request State Watermaster Service.)
3. If DWR is unable to verify compliance with the decreed water rights by 1/1/05, seek State Water Resources Control Board oversight and verification.
4. Develop a standard format for collection and reporting of diversion data.
5. Seek and obtain funding for the first three years.

Long-term: Seek state funding for general-fund portion of long-term Watermaster Service and implementation. Include water users in a DWR request for an incidental take permit for Watermaster Service.

8.2.1.3 Ramped Flows for Diversions

Issues: Especially at the beginning of the irrigation season, a significant number of irrigators often begin diverting at the same time. This action may severely lower water levels almost instantaneously, causing fish stranding or other impacts.
Solutions: Institute a cooperative agreement between diverters to stage their irrigation starts and completions to gradually change flows over several days.

WM-3a On the Shasta River, through Shasta CRMP, DWR and irrigators' cooperation, establish a voluntary program to stagger or rotate irrigation starts and completions (ramped flows). Monitor success.
Short-term: Continue and expand this effort.
Long-term: Continue appropriate implementation, monitor, and adaptively manage. Develop a long-term plan for implementation.

WM-3b On the Scott River, investigate if ramping would be beneficial or necessary.
Short-term: Survey water users, the Department, and watermaster staff. Publish results. Begin implementation if appropriate.
Long-term: Continue appropriate implementation. Monitor and adaptively manage. Develop a long-term plan for implementation.

8.2.1.4 Pulse Flows

Issues: Juvenile emigrants or other life stages may have difficulty migrating during some periods.

Solutions: Produce a pulse of flow, which will aid in migration.

WM-4a On the Shasta, the Shasta CRMP and the Department, through voluntary participation and compensation, develop an agreement under which landowners pull diversions for a limited period to allow a resulting pulse flow to travel downstream.
Short-term: On the Shasta, implement voluntary program among diverters to create pulse flows; augment with cost funding as needed. Monitor both flow and fish distribution results. Integrate findings of flow-temperature model in planning. Establish a monitoring protocol.
Long-term: Reduce and eliminate barriers and water quality problems that create need for it in the first place. Integrate this effort with TMDL process.

WM-4b On the Scott, the Department should research with the SRWC and RCD to determine if some streams could benefit with a pulse flow
Short-term: Implement research recommendations.

8.2.1.5 Using Unused Water and Water Rights for Instream Fish Flows

Issues: Low instream flows limit habitat for coho salmon and other salmonids.

Solutions: Some water rights are currently not being exercised under existing decrees. Work within the water rights process to allow water rights holders to temporarily dedicate currently unused rights to instream flow.

WM-5a DWR and SWRCB should outline the procedure for developing instream flow dedications. Develop incentives for acquiring instream flow.
Short-term: Watermasters will:

1. Continue and expand opportunities to help manage flows on some streams;
2. Develop an informational report to describe the process and incentives; identify potential for future measures;

3. Develop guidelines to protect water users, inform funders, and ensure that water is used for instream flows.

WM-5b On the Scott, SRWC and DWR should determine unused diversion rights and approach those diverters about providing flows for instream use without affecting the water rights of others.
Short-term: Once agreements are reached, work to inform other downstream users as to water amounts to be left in the stream. Oversee and shepherd those flows.
Long-term: Acquire flows for permanent dedication.

WM-5c On the Shasta, the CRMP and DWR should determine unused diversion rights and approach those diverters about providing flows for instream use without affecting the water rights of others.
Short-term: Once agreements are reached, work to inform other downstream users as to water amounts to be left in the stream. Oversee and shepherd those flows.
Long-term: Acquire flow for permanent dedication. Include options for Dwinnell, Greenhorn, and other storage reservoirs.

8.2.1.6 Irrigation Rotation Program

Issues: Low instream flows limit habitat for coho salmon and other salmonids and inhibit movement of coho salmon juveniles to secure rearing habitat.

Solutions: For certain stream and river reaches, diverters could rotate irrigations so not all users are on line at the same time when flows are critical for fish. This would leave additional flow in the stream to maintain or enhance habitat at critical times.

WM-6a Within watermastered areas, DWR watermasters could work closely with irrigators to develop creative water management techniques to benefit coho salmon. Develop incentives. Focus on key areas.
Short-term: The Department should identify critical habitat reaches and times that might benefit from this activity. DWR should continue pilot program. On the Shasta River, demand on river is variable and coordination among users would improve conditions.

WM-6b On non-watermastered reaches of the Scott River HA, develop a test program with tributary groups.
Short-term: Contact various tributary or ditch groups to assess willingness and difficulty. Execute pilot program. Write up results.
Long-term: Continue to work with groups on irrigation coordination and other water management; expand as warranted.

8.2.1.7 Install Head Gates and Measuring Devices on Diversions

Issues: Low instream flows limit habitat for coho salmon and other salmonids and inhibit movement of coho salmon juveniles to secure rearing habitat. Many diversions do not have flow control devices or ways to measure discharges into the diversion. Without control structures and accurate measurements, diversions cannot

be managed easily for changing stream flows and some users could be diverting more than their proper allotments. (See also WM-2 for verification.)

Solutions: Provide head gates and measuring devices for diversions.

WM-7a Within watermastered areas, continue DWR's program of constructing head gates and measuring devices on diversions.
Short-term: Seek additional funding for these structures to help encourage timely installation. Install on all watermastered diversions by 2006.

WM-7b Seek additional funds to provide structures for willing irrigators in non-water-mastered areas; the Department, DWR, SRWC or RCD could participate.
Short-term: Seek funding to provide measuring weirs and devices to willing irrigators. Install weirs and measuring devices as requested. (See recommendation WM-7a)
Long-term: Continue program until all diversions have gates and are measurable.

WM-7c On Shasta River, riparian users should participate.
Short-term: Provide devices to riparian users. Continue to require riparian and pre-1914 water users to file annual statements of diversion and use.

8.2.1.8 Water Availability Projections and Forecasts

Issues: Lack of prediction of water-year type limits opportunities for water management. Lack of short-term predictions similarly constrains planning for mid-season water use.

Solutions: Forecasting stream flows for the water year based on snow surveys, precipitation, and aquifer condition within the season could aid water management techniques, such as irrigation rotation and harvesting, and thereby provide additional instream flows and habitat.

WM-8a On the Scott, DWR, SRWC, USFS, and other partners should study the correlation of stream flow with other parameters to closely predict weekly flow rates (cfs).
Short-term: Develop work/study plan. Collect additional data. Hire consultant team. Implement. Seek additional funding to initiate and implement a predictive program.
Long-term: On-going.

WM-8b On the Shasta, DWR, USFS, Shasta CRMP and other partners should study the correlation of stream flow with other parameters to closely predict weekly flow rates (cfs).
Short-term: Develop a work/study plan. Collect additional data. Hire consultant/team. Implement. Seek additional funding to initiate and implement a predictive program.
Long-term: On-going

8.2.1.9 Instream Flow Studies and Recommendations

Issues: Flow-habitat relationships for coho salmon have not been established and the amount of habitat required for coho salmon recovery has not yet been identified.

Solutions: Conduct an instream flow study to develop the relationship between flows and habitat. Develop the relationship between flow and habitat availability for the different life stages of coho salmon.

WM-9 The Department and USFWS in cooperation with the community should seek funding to conduct instream flow studies on the Scott and Shasta to determine flow-habitat relationships. Quantify how much, where, and when stream flow is needed for coho salmon rearing life stages.
Short-term: As an interim measure and in coordination with the Dry Year Water Plan and other recommended water management measures, identify target minimum instream flows for the tributaries that provide coho salmon summer rearing habitat. Use the best, scientifically valid method suitable for the analysis. Seek funding and carry out study using agreed-upon scientists identified by the Shasta CRMP and the Technical Committee of the SRWC. Explore different instream flow assessment methods including, 1D and 2D modeling, microhabitat mapping, hydrologic modeling and others. Use Water Balance information, including feasibility aspects. Evaluate potential application of a Conservation Implementation Program.
Long-term: Integrate findings into watershed planning processes.

8.2.1.10 Groundwater Studies

Issues: Low instream flows limit habitat for coho salmon and other salmonids and inhibit movement of coho juveniles to secure rearing habitat. Some groundwater withdrawals appear to be linked to surface flows, but effects are not conclusive given other factors (climate change, precipitation variations, upland vegetation changes and removed barriers).

Solutions: Study groundwater availability in the Scott and Shasta Valley to determine groundwater status and potential needs and opportunities regarding groundwater management.

WM-10a DWR, the Shasta CRMP, and other partners should seek funding and cooperators to conduct a comprehensive groundwater study of the Shasta Valley.
Short-term: Seek funding, conduct the study, and make recommendations that would help preserve or enhance instream flows. Look at using groundwater from wells not connected with the river during low-flow periods and effect of infiltration from unlined ditches. Lead agencies will apply for funds for 2-year study by May 2004,
Long-term: Implement recommendations as applicable. Coordinate results with water supply augmentation options.

WM-10b Prepare a comprehensive study updating previous work by USGS (Seymour Mack 1958) and DWR to determine the current status of groundwater in the Scott Valley and its relationship to surface flows. Studies should include factors such as climate change, adjudications/decree verification, precipitation variability, changes in upland vegetation and removal of diversions and natural dams (e.g., beaver dam) that would have elevated groundwater levels.
Short-term: Obtain funding to update the study. Find additional wells and cooperative landowners to measure monthly groundwater levels and develop current groundwater contours. Analyze data to assess management options. Look at using groundwater from wells not connected with the river during low flow periods. Lead agencies will apply for funds for 2-year study by May 2004.
Long-term: Coordinate results with water supply augmentation options.

WM-10c Prior to groundwater study completion, recommend that County establish a process for developing groundwater management plans. If the comprehensive groundwater study shows the necessity, the County should initiate a basin-specific groundwater plan to protect the resource of groundwater for all users, including fish.
Short-term: Review results of groundwater study and previous county work. Recommend that by 2005, the County appoint a broadly representative, community-based steering committee to develop the idea. Formalize the process for preparing basin-wide plans using groundwater study results. Beginning in 2006, review and analyze study results and determine thresholds and actions to protect resource for all users.
Long-term: Implement plan.

8.2.1.11 Water Balance Study

Issues: The connection between surface water and groundwater and the sources and sinks of water are poorly understood. This lack of knowledge limits the ability to take actions to increase instream flow and maintain the groundwater levels necessary to support riparian vegetation.
Solutions: Conduct studies that will provide the missing information and use that information to guide water management, water augmentation, and habitat enhancement.

WM-11a Support completion of the Scott River Water Balance Study to learn how water behaves in the river; in particular establish the fate of water added to the Scott River to increase instream flow. The study should identify the best locations to augment flow and predict the impact of the additional water at downstream locations. Apply the results of the completed Water Balance Study to water management, water augmentation, and habitat enhancement recommendations.
Short-term: Obtain funds to complete Water Balance Study. Use results to guide projects that will support improvement to coho salmon habitat.
Long-term: Continue implementation.

WM-11b Support preparation of a water balance study for the Shasta River to learn how water behaves in the river; in particular establish the fate of water added to the river to increase instream flow. The study should identify the

best locations to augment flow and predict the impact of the additional water at downstream locations. Apply the results of the completed study to water management, water augmentation, and habitat enhancement recommendations.
Short-term: Obtain funds to prepare Water Balance Study. Use results to guide projects that will support improvement to coho salmon habitat.

8.2.2 WATER AUGMENTATION RECOMMENDATIONS

Water augmentation recommendations are presented in seven sub-categories.

8.2.2.1 Water Trust (water leasing)

Issues: Low instream flows limit survival and growth during some coho salmon life stages.

Solutions: Provide a structured process for willing participants to donate, sell, or lease water or water rights to provide improved stream flow for coho salmon and habitat at critical periods.

WA-1a Support the ongoing efforts of the Scott River water trust to create an endowment that will support the Trust as a non-permanent agent for buying water to augment instream flows.
Short-term: Complete the Phase 1 study funded by a Department grant. Phase 2, implementation of the Water Trust, will occur no later than 2006 if Phase 1 supports feasibility of the process. Verification of the adjudication should be a concurrent activity to use of the Water Trust to ensure that legal use of water is addressed and that flows reflect this.
Long-term: Continue as needed with the expectation that instream flow issues will be addressed and remedied, making this function less important.

WA-1b Promote the establishment of a Shasta River Water Trust.
Short-term: Explore options to create the Shasta River Water Trust and implement as applicable. Identify willing participants in the short term until longer-range solutions are available or in place.
Long-term: Continue as needed with the expectation that instream flow issues will be addressed and remedied, making this function less important.

WA-1c Create an endowment to provide funding for water leasing and purchase.
Short-term: Find commitment for funding a water leasing or purchase program. Solicit agency support. Evaluate potential application of a Conservation Implementation Program.

WA-1d Initiate measures to create or enhance instream flows by reducing irrigation starting in September to promote access and connectivity of existing spawning areas; capitalize on available adult returns. Where this applies to rearing areas, it would also benefit juveniles.

8.2.2.2. Study Additional Large Surface Water Storage

Issues: Low instream flows limit survival and growth during some coho salmon life stages. Winter runoff once out of the system cannot be recovered to provide year round flows at critical times to benefit coho salmon.

Solutions: Study the feasibility of building storage reservoirs to capture excess winter runoff and manage stream flows more for the benefit of coho salmon. Implement if feasible and acceptable. The intent of the stored water would be to benefit coho salmon, not to increase the irrigation acreage or volume.

WA-2a	Initiate reconnaissance level studies to identify possible surface storage opportunities and possible fatal flaws for those alternatives in the Shasta River watershed. Off-stream reservoirs may provide storage yet maintain current or improved fish habitat. The study should identify management alternatives. **Short-term:** Identify environmental concerns for additional water storage, including those on steelhead and Chinook and develop proposal to alleviate. Initiate reconnaissance level study of increasing storage at Lake Shastina and opportunities for use of water from Greenhorn Reservoir. **Long-term:** Seek funding for and implement feasible projects.
WA-2b	Initiate reconnaissance level studies to identify possible surface storage opportunities and possible fatal flaws for those alternatives in the Scott River watershed. Off-stream reservoirs may provide storage yet maintain current or improved fish habitat. The study should identify management alternatives. **Short-term:** Look into historical and proposed water storage reservoirs; expedite the process at the elected official and agency levels. Consider potential impacts on Chinook and steelhead. Consider Noyes Valley, Wildcat Creek, Kidder Valley off-stream and other off-stream and upslope sites. **Long-term:** Consider option of ditching or pumping water to storage area. Determine how to avoid usual problems with water storage, such as infilling of the storage structure with sediment, address channel maintenance flows, etc. Seek funding for and implement feasible projects.

8.2.2.3. Small Storage Opportunities (off-stream or high mountain lakes)

Issues: Low instream flows limit survival and growth during some coho salmon life stages. Winter runoff once out of the system cannot be recovered to provide year round flows at critical times to benefit coho salmon.

Solutions: Raise the levels of existing small lakes or create storage using small off-stream reservoirs rather than one large reservoir.

WA-3a	Study raising additional mountain lakes in a reconnaissance level effort. **Short-term:** Support current partnership effort to rehabilitate Cliff Lake to provide 150 acre-feet of water for coho salmon rearing and migration;

Identify USFS small storage locations that have not been maintained.
Long-term: Seek funding for and implement feasible projects.

WA-3b Study using small, off-stream ponds for increased storage.
Short-term: Identify options for off-stream storage on public and private lands.
Long-term: Seek funding for and implement feasible projects.

8.2.2.4 Store Water with a Conjunctive Groundwater Use Program and Groundwater Recharge Ponds

Issues: Low instream flows limit survival and growth during some coho salmon life stages.

Solutions: Initiate reconnaissance level study of operating surface storage in conjunction with groundwater storage. Establish groundwater recharge ponds that receive and capture high winter river and stream flows and allow that water to percolate and recharge the aquifer. Recharging/maintaining the groundwater may be used to increase stream flows (e.g., recharging groundwater that is connected to the surface flows or using the groundwater to replace surface diversions).

WA-4a Along with general groundwater investigation on the Shasta (see WM-11a), include coordinating groundwater storage with operation of Lake Shastina.
Short-term: Conduct Shasta Groundwater Study to obtain basic data. Evaluate potential application of a Conservation Implementation Program.
Long-term: Look at options for conjunctive use in specific study.

WA-4b On the Scott, as part of both the general groundwater investigation and the surface reservoir investigation (see WM-11b), include conjunctive groundwater operation.
Short-term: Find funding and implement reconnaissance level study. Evaluate potential application of a Conservation Implementation Program.
Long-term: Pursue feasibility study and implement if warranted.

WA-4c On both the Scott and Shasta, investigate the most efficient ways to recharge groundwater. Mechanisms could include recharge ponds, unlined ditches, or others. Evaluate pre-season flooding of agricultural land for groundwater recharge.
Short-term: Find funding and initiate groundwater and hydrologic studies, develop groundwater management criteria (yield and withdrawal criteria), identify possible recharge locations, and conduct reconnaissance level studies, which includes legal aspects. Evaluate potential application of a Project Conservation Implementation Program.
Long-term: Pursue feasibility study and implement if warranted.

8.2.2.5 Scott Valley Tailings Water Storage

Issues: Low instream flows limit survival and growth during some coho salmon life stages.

Solutions: On the Scott River, reshape dredge tailings to provide additional water storage within the remaining tailings.

WA-5 Initiate reconnaissance-level study of options for a tailings rehabilitation and water storage project. Pursue viable options; coordinate water storage with restoration.
Short-term: Find funding and implement reconnaissance level study.
Long-term: Pursue feasibility study and implement if warranted.

8.2.2.6 Water Conveyance to Shasta Valley from Main Klamath

Issues: Low instream flows limit survival and growth during some coho salmon life stages.

Solutions: A water diversion of between 100 and 200 cfs from the mainstem Klamath River above Iron Gate Reservoir could provide irrigation water to the Shasta Valley greatly reducing the need for water diversions and groundwater pumping for agricultural purposes. The majority of the low temperature, high quality water from the Shasta River would then be left in the stream to the benefit of spawning and rearing coho salmon.

WA-6a Study the legality of a water conveyance to Shasta Valley from the mainstem Klamath River.
Short-term: Verify the legal status of the several reserved water rights for the Shasta Valley, and map out the best strategy to exercise them. Coordinate with the relicensing before FERC.

WA-6b Conduct feasibility study of water conveyance to Shasta Valley from the mainstem Klamath River.
Short-term: Study engineering and environmental considerations of the various point-of-diversion possibilities, including capital and operation costs and biological and ecological considerations. Select most promising approach. Determine how much water is needed in Shasta Valley with Dwinnell Dam intact and without Dwinnell Dam.

8.2.2.7 Acquiring Water Rights

Issues: Low instream flows limit survival and growth during some coho salmon life stages.

Solutions: Acquire water rights that shall be dedicated to instream flow.

WA-7a Conduct reconnaissance-level investigations of acquiring water rights.
Short-term: Conduct cost-benefit analysis that includes socio-economic effects to community and legal considerations; Present options and survey public support. Proceed as warranted.

WA-7b Depending upon results of study of acquiring water rights, engage and support projects.
Short-term: Solicit interest from willing participants. Evaluate potential

	application of a Conservation Implementation Program. **Long-term:** Continue short-term actions.
WA-7c	Apply the results of appropriate studies (e.g., water balance, instream flow, coho salmon population surveys) to prioritize the purchase of water rights. **Short-term:** Complete and synthesize studies; fund implementation.

8.2.3 HABITAT MANAGEMENT RECOMMENDATIONS – SCOTT RIVER

These recommendations cover improving rearing habitat, temperature, habitat structure, passage, and spawning habitat.

8.2.3.1 Improvement of Summer and Winter Rearing Habitat – Lack of Habitat Complexity

Issue: The Scott River watershed has experienced a loss of summer and winter rearing habitat for juvenile coho salmon. Juvenile coho salmon naturally move throughout the year looking for suitable temperature, cover, flow velocity, and food supply. Large logs, small woody debris, boulders, pools, side channels, beaver ponds, springs, and accessible wetlands provide habitat complexity and are "safe havens" for coho salmon juveniles. Protection from high flows, such as can be found around large structures in the stream or in backwaters connected to the stream, is necessary for over-wintering survival of juvenile coho salmon. Riparian vegetation provides habitat complexity and is an important element supporting juvenile rearing habitat for coho salmon. Riparian vegetation has been reduced for a variety of reasons, including lowering of the water table and channel destabilization.

Current information shows a positive relationship between coho salmon presence and beaver ponds. The valley was historically heavily populated with beaver until mid-1800s. Today small populations exist. The rather stable ponds created by these animals, especially on valley tributaries, likely created year round fish rearing habitat, including the period of low stream flow.

Changes in stream channel form and function may have limited riparian restoration potential. Changes in hydrologic conditions, such as changes in groundwater and water use may also limit riparian restoration potential. The loss of off-channel habitat results in a loss of productive rearing and over-wintering areas, often favored by species such as the coho salmon.

Solution: Identify and conserve existing rearing habitat. Restore lost rearing habitat where possible. In locations where there are problems, increase habitat complexity. Find new ways to increase riparian vegetation in addition to continuing current efforts.

Scott HM-1-1a Study the habitat needs of rearing coho salmon in the Scott River watershed. Identify critical existing coho salmon rearing habitat. For the protection of riparian habitat, see recommendation P-2.
Short-term: Secure funding; work with landowners to gain access; explore methods to obtain the necessary data to implement the appropriate coho salmon recovery projects; develop an action plan to prioritize projects. Coordinate with other ongoing agreements and scheduling.
Long-term: Implement and evaluate projects.

Scott HM-1-1b Identify methods for increasing habitat complexity and appropriate locations for instream habitat structures to create pools, increase habitat complexity, and improve bank stabilization. All bank stabilization projects should be done in a fish-friendly manner.
Short-term: Research and quantify locations and develop restoration plans for them. Define what constitutes fish-friendly bank stabilization. Evaluate existing alternative bank stabilization methods. Continue to seek funding and carry out specific projects.
Long-term: Assess and monitor activities to determine whether or not instream structures are working properly and doing no harm. There should be a decreasing need to install instream structures as natural river channel processes (i.e., channel meander, riparian vegetation recruitment, reduced sedimentations, etc.) are improved.

Scott HM-1-1c Encourage riparian restoration projects using locally native vegetation. Project implementation should consider if: 1) the site previously supported riparian vegetation and still has the soil and hydrologic characteristics to support it; 2) the native plants selected are likely to flourish; 3) the width of the planted riparian zone is appropriate for the hydrologic regime at the site; and 4) the plan includes effectiveness monitoring using approved protocols. Establish procedures for recommending appropriate plant materials where natural conditions are significantly compromised.
Short-term: Support on-going riparian restoration efforts and continue to seek funding and carry out projects with an emphasis on the tributaries, especially those identified as potentially major streams inhabited by coho salmon. Evaluate outcomes of replanting and research causes of riparian planting outcomes, appropriate width of planted areas, and new strategies for restoration. Monitor past projects to secure updated information on most effective techniques.
Long-term: Assure implementation monitoring with emphasis on protecting coho salmon refugia.

Scott HM-1-1d Continue riparian easement programs.
Short-term: Seek cooperation from local landowners. Compensate land-owners for short- or long-term protection of their riparian property.

Scott HM-1-1e Evaluate the use of beaver ponds and other efforts that contain similar benefits to increase habitat complexity.
Short-term: Review literature (studies done in Washington and Oregon). Hold workshops and publish newsletters as appropriate. Investigate projects in prioritized areas to support beaver activity if appropriate. Coordinate with related projects to improve stream complexity and habitat. If projects are planned, ensure that riparian growth is adequate or provide materials for beaver needs, so that appropriate riparian cover is maintained.
Long-term: Include implementation monitoring. If beaver re-introduction fails or is found to be inappropriate, consider analogous habitat attribute efforts.

8.2.3.2 High Water Temperatures

Issue: Water temperatures are influenced by amount of river flow, and river structure (W/D ratios, etc.), air temperature, shading from terrain and vegetation, influx of groundwater, tributary flow and runoff, and other factors, including aggraded streambeds and sedimentation. High water temperatures can stress coho salmon, increasing disease and mortality.

Water temperature is listed as a significant problem for the Scott River (303d impaired) and the condition is associated with current summer flow regime and the valley structure of the river (high width to depth ratios). Water temperature influences the development and survival of coho salmon by affecting different physiological processes such as growth and smoltification. Water temperature affects migration timing and the fishes' ability to cope with predation and disease and exposure to contaminants. High water temperatures also create thermal barriers to migration.

Solution: Identify and remedy conditions that contribute to high water temperatures. Restore structure of river. Modeling water temperature and flow relationships in the mainstem will help guide the timing of water additions to the river and selecting the best locations for restoration of water table, meander pattern, and slope.

Scott HM-1-2a	Identify location, timing, frequency and duration of thermal barriers to migration for adult and juvenile coho salmon. Develop habitat improvement measures that address temperature. **Short-term:** Identify and map locations and timing of thermal barriers. Coordinate information and projects to address appropriate solutions in prioritized areas with the most benefit to coho salmon. **Long-term:** Implement projects or measures in coordination with over-all habitat recovery process and monitor for improvements in an adaptive fashion.
Scott HM-1-2b	Investigate the contribution to stream cooling of the flow of cool water through gravel. Investigate the interference of fine sediment in that process. **Short-term:** Seek funding and carry out study using agreed-upon scientists identified by the Technical Committee of the SRWC. **Long-term:** Use results to plan projects and drive adaptive management.
Scott HM-1-2c	Install systems that treat warm water or percolate it through the ground to cool it. **Short-term:** Seek funding and carry out projects where appropriate.
Scott HM-1-2d	Model the relationship of temperature and flow and use the results to plan the timing and locations of water additions to the river. **Short-term:** Fund and implement temperature studies. Coordinate with the NCRWQCB TMDL process in data collection. **Long-term:** Monitor projects to determine optimum benefits are achieved with implementation of habitat improvement actions.

8.2.3.3 Improve Valley and Low-gradient Tributary Channel Structure and Function

Issue: Historical accounts indicate that in the early 1900s the Scott River in the valley was narrow and deep (with more of a meander pattern) and was more in contact with its floodplain. Today the river is currently a mix of reaches, some are narrow and riprapped, while others are broad and wide. Channel recovery is impeded. Most reaches illustrate large width to depth ratios. This fact, combined with summer low flows and minimal riparian shading, lead to very warm stream temperatures during the summer months.

In other reaches, down-cut channel conditions, loss of meander pattern, and increased stream gradient all translate to increased amounts of stream flow (stream power) during higher flows resulting in increased streambank erosion and the need for rip rap. Down-cut channels also act as drains to surrounding land resulting in a lowering of the water table. This has ramifications on water storage, riparian vegetation, and stream-bank stabilization.

Solution: Restore valley river structure to an appropriate meander pattern, decreased channel slope, decreased width-to-depth ratios, proper connections with the floodplain and side channels, where feasible.

Scott HM-2a	Evaluate the geomorphology of the Scott River system. Identify all areas of high width-to-depth ratios, with entrenched channels, or other compromised areas. **Short-term:** Implement projects that improve stream geomorphology at specific locations in conjunction with system-wide stream channel improvement. Identify and apply consistently a system of stream classification. Acquire expert input to understand fluvial processes and formulate plan of recovery. Map areas of unstable banks, high width-to-depth ratios, or entrenched channels. Develop a Request for Proposals for stream channel restoration projects that are based in natural process restoration. **Long-term:** Implement a long-term monitoring program to assess responses to implemented restoration projects, with monitoring sites established to measure, for example, cross-sectional channel profile, substrate composition, stream-bank condition (including riparian vegetation), and photo points.
Scott HM-2b	Identify locations where the main channel can be reconnected to its floodplain and historic sloughs to allow formation of side channels without negative impacts to the community. Implementation of this recommendation should be done after remediation of the Callahan Dredger Tailings. **Short-term:** Assess the feasibility of setback levees to restore channel function. Survey with funding. Prioritize projects and solicit buy-in. Utilize information from habitat studies above to select locations for the best cost/benefit to coho salmon. **Long-term:** Implement projects as appropriate. Include appropriate monitoring of this effort.

Scott HM-2c Restore the Scott River floodplain in the Callahan Dredger Tailings reach, through a community-driven process supported by the SRWC.
Short-term: Review Tom Hesseldenz and Associates report to USFWS. Secure funding to establish a stakeholder group (including agencies and design consultants) to formulate a process and plan to restore the tailings.
Long-term: Secure funding and implement tailings restoration.

8.2.3.4 Barriers to Fish Passage

Issue: Juvenile coho salmon need access to rearing habitat that is suitable at different times of the year; however, natural and other barriers may prevent them from moving freely. Barriers to juvenile fish movement are found where streamflow goes sub-surface and where impediments in the channel block fish passage. Some barriers are the result of human activity and have the potential of being remedied.

Coho spawners return to the Scott River in November, making their way up through the canyon to spawning grounds. Particularly in drought years, natural and other barriers may delay or prevent coho salmon from reaching spawning areas. Barriers to movement are found where streamflow goes sub-surface and where impediments in the channel block fish passage. Some barriers are the result of human activity and have the potential to be remedied.

Solution: Continue to investigate and implement fish passage improvement projects and promote the surface connectivity of streams that provide coho salmon habitat.

Scott HM-3a Identify location, timing, duration and frequency of low flows that prevent juvenile access to rearing habitats.
Short-term: Compile information and incorporate into a GIS.
Long-term: Implement actions to remediate barriers.

Scott HM-3b Identify, prioritize, and treat barriers on private roads, consistent with the Five Counties process for road assessments. Prioritize projects for benefit to coho salmon and implement with completion dates in the near term (1-3 years).
Long-term: Implement actions to remediate barriers.

Scott HM-3c Investigate opportunities to construct low-flow channels through alluvial fans to improve fish passage (short- and long-term) in all tributaries from French Creek north.
Short-term: Compile data describing where barriers are found. Secure funding to formulate a process and plan to restore the aggraded reaches.
Long-term: Secure funding and implement restoration.

8.2.3.5 Improvement of Spawning Habitat

Issue: Spawning coho salmon require gravel with rocks within a particular size range. They prefer spawning locations with adequate habitat complexity to prevent redds from washing out in floods and provide cover nearby for emerging fry. Moffett Creek has a high sediment load, can run turbid, and contributes a large amount of fine-

grained sediment to the Scott River. Large pools in the Canyon Area are reduced in volume due to granitic sand loading. In other locations, aggradations of larger cobbles and boulders have covered or replaced spawning gravels. Erosion from mining tailings affects many tributaries from the South Fork to Scott Bar.

Solution: Identify and conserve existing spawning habitat. Restore lost spawning habitat where possible. In locations where there are problems, increase habitat complexity and gravel quality.

Scott HM-4a	Identify existing coho salmon spawning habitat. Study the habitat needs of spawning coho salmon in the Scott River watershed. Protect and maintain spawning habitat to prevent further loss of the species. **Short-term:** Secure funding. Continue and expand existing surveys. Quantify spawning habitat. Use this information to prioritize projects for habitat restoration and enhancement. **Long-term:** Continue to use results to plan projects and drive adaptive management.
Scott HM-4b	Improve spawning gravel quantity and quality. **Short-term:** Develop a sediment budget; identify locations with an action plan for desired future conditions; and determine and remediate causes of aggradation. Identify locations that have poor quality or lack adequate spawning gravels but in other respects meet coho salmon spawning requirements. Remove fine sediment from gravels in locations that otherwise meet coho salmon spawning requirements but where gravels are buried. Remove large, aggraded rock from locations that otherwise meet coho salmon spawning requirements but where gravels are buried. Assess gravel recruitment and augmentation locations. **Long-term:** Design, secure funding, and implement projects.
Scott HM-4c	Identify and remedy sources of fine sediment within the SSRT area. **Short-term:** Secure funding and conduct surveys. Use this information to implement projects to reduce sediment input. **Long-term:** Continue as needed.

8.2.4 HABITAT MANAGEMENT RECOMMENDATIONS – SHASTA RIVER

These recommendations cover improving rearing habitat, fish passage, spawning gravel management, riparian vegetation management, and temperature.

8.2.4.1 Improvement of Rearing Habitat

Issues: Inaccessibility to tributaries, high stream temperatures, and lack of habitat complexity limit coho salmon production within the Shasta River.

Solutions: In the short-term identify and maintain existing spawning and rearing habitats. In the long term, create multiple refugia areas, and/or re-link those no longer accessible. Establish recovery goals.

Shasta HM-1a Identify existing areas successfully used for rearing and potential rearing areas by conducting entire mainstem channel-length survey: 1) water temperature/refugia; and 2) habitat suitability based on slope and water velocity. Estimate carrying capacity and fish utilization of rearing habitat. Identify spawning areas and determine accessibility to rearing areas.
Short-term: Secure funding, conduct habitat, spawning, and rearing surveys, and prepare analysis.
Long-term: Use results to guide and prioritize projects to insure best benefit to coho salmon and overall restoration of the river.

Shasta HM-1b Implement habitat protection, restoration, and improvement projects that enhance rearing habitat in high priority areas.
Short-term: Focus on areas currently accessible or potentially accessible to coho salmon (e.g., below Greenhorn and Dwinnell Dams). Conduct habitat suitability studies (see also Shasta HM-1a) on other streams to guide future actions. Coordinate with long-range planning effort for addressing barriers (Shasta HM-2). Possible projects to include are livestock control or exclusion fencing, tree and emergent planting, bioengineered bank stabilization, and irrigation tailwater reduction.
Long-term: Continue projects. Monitor for effectiveness over the long term, utilizing adaptive management to fine-tune projects for best benefit to coho salmon.

Shasta HM-1c Implement habitat protection and improvement projects that enhance rearing habitat in high priority areas.
Short-term: Focus on areas currently accessible or potentially accessible to coho salmon (e.g., below Greenhorn and Dwinnell Dams). Conduct habitat suitability studies (see also Shasta HM-1a) on other streams to guide future actions. Coordinate with long-range planning effort for addressing barriers (Shasta HM-1b). Possible projects livestock control or exclusion fencing, tree and emergent planting, bioengineered bank stabilization, irrigation tailwater reduction.
Long-term: Continue projects. Monitor for effectiveness over the long term, using adaptive management to fine-tune projects for best benefit to coho salmon.

8.2.4.2 Barriers to Fish Passage

Issues: Juvenile coho salmon need access to rearing habitat that is suitable at different times of the year; however, natural and other barriers may prevent them from moving freely. Barriers to juvenile fish movement are found where streamflow goes sub-surface and where impediments in the channel block fish passage. Some barriers are the result of human activity and have the potential of being remedied.

Solutions: Continue to investigate and implement fish passage improvement projects and promote the surface connectivity of streams that provide coho salmon habitat.

Shasta HM-2a Identify barriers to fish passage throughout the watershed for adults and juveniles, and work to implement solutions to these barriers.
Short-term: At each site assess impacts on water quality and assess importance for coho salmon passage at each site. Assign each dam/impoundment a priority for reduction or removal. Work with users to

	select workable management measures. Implement short term solutions and work towards removal or remediation of passage problems at flashboard dams as soon as possible where feasible; otherwise develop temporary modifications to minimize passage and water quality problems. **Long-term:** Implement removal or remediation of passage problems at flashboard dams where feasible, otherwise modify to minimize passage and water quality problems. Continue to work with affected landowners and implement workable solution. Refine and Implement long-term solutions.
Shasta HM-2b	Same as Shasta HM-2a **Short-term:** Develop working group to create long-range strategy for Greenhorn and Dwinnell, including assessment of suitability of habitat upstream, options for passage or modification/removal. **Long-term:** Develop a long-term solution and implement that if it is different from short-term outcome.
Shasta HM-2c	Same as Shasta HM-2a **Short-term:** Provide for passage at Highway 3 as soon as possible; determine impacts on water quality, if any, at all sites. **Long-term:** Develop a plan for complete removal if possible. Implement TMDL plans.
Shasta HM-2d	Same as Shasta HM-2a **Short-term:** Provide for passage above A-12 to Big Springs refugia area as soon as possible. Determine impacts on water quality, if any. **Long-term:** Develop a plan for complete removal if possible.
Shasta HM-2e	Same as Shasta HM-2a **Short-term:** Work with Shasta Temperature model and through TMDL process to establish appropriate targets based on system capability. Provide for passage to safe areas in the short term.
Shasta HM-2f.	Same as Shasta HM-2a **Short-term:** Studies/repairs underway. Continue to completion. **Short-term:** Monitor for management, maintenance and effectiveness.
Shasta HM-2g	Same as Shasta HM-2a. See WM-9 for flow recommendations. **Short-term:** Develop target initial instream flows to re-water channel year-round. **Long-term:** Purchase or lease water. Assess appropriateness of flow tested. Adjust.
Shasta HM-2h	Same as Shasta HM-2a. **Short-term:** Develop a plan for the second and seek funding. **Long-term:** Implement barrier modification on second barrier.
Shasta HM-2i	Same as Shasta HM-2a. **Short-term:** Implement results of on-going study of road barriers on Parks Creek.

8.2.4.3 Spawning Gravel Management

Issues: In the Shasta River, severe limits on spawning gravel exist below Dwinnell Dam due to natural geological conditions. Historic in-channel gravel mining in the mainstem, gold mining in Yreka Creek and its subsequent channelization, and the construction of Greenhorn Dam exacerbated that shortage. Greenhorn Dam also blocks the input of gravel to Yreka Creek and Shasta Canyon. Those natural geologic

conditions (the filling of the Shasta Valley with volcanic debris approximately 300,000 years ago) make coarse-sediment supply in the Shasta extremely limited and present coarse-sediment transport conditions that probably exist nowhere else on earth.

Under current conditions, existing spawning gravel has essentially no way of cleansing or replacing itself, leading to higher mortality of eggs in gravels. Presence of Dwinnell Dam limits peak flows that historically cleaned gravels. Remnant gravels may have substantially less capacity for fine sediment than natural conditions once allowed, due to lack of periodic removal of fines.

Solutions: Improve spawning gravel quality and quantity and reduce input of fine sediment.

ShastaHM-3a	Continue to submit funding request for a Shasta river watesehd gravel budget study. The gravel budget study will guide implementation of all recommendations in this section. Use this information to develop projects to benefit coho salmon spawning, secure funding, and implement. **Long-term:** Monitor. Continue implementation of plan as hydrologic conditions dictate.
Shasta HM-3b	Determine natural processes that historically maintained spawning gravel. Identify methods of restoring quantity and quality of gravel. **Short-term:** Conduct gravel budget study and apply results of study to needs of coho salmon. **Long-term:** Re-create historic process if feasible; mitigate if not. Artificial supplementation may be necessary due to loss of natural processes and historic removal.
Shasta HM-3c	Identify and map existing and potential spawning gravel locations and sources of gravel. Evaluate suitability for spawning and access to rearing areas for emergent fry. **Short-term:** Conduct Gravel Budget study and apply results of study to needs of coho salmon. **Long-term:** Monitor condition over time and continue to apply results of the study.
Shasta HM-3d	Identify and quantify sources of fine sediment and mitigate their effect on spawning gravel quality. **Short-term:** Accelerate restoration measures, especially livestock exclusion fencing and emergent plantings. Investigate role and importance of spawning salmon in maintaining gravel cleanliness under the unique conditions found in the Shasta River. **Long-term:** Establish basin-wide monitoring program to chart changes over time in fine sediment. Develop fine sediment budget for the river. Assess status. Integrate fine sediment problem into long-range planning for Dwinnell Dam, potential use of flushing flows to maintain habitat, and establishing instream flow needs.

8.2.4.4 Riparian Vegetation Management

Issues: Riparian vegetation is an important element supporting juvenile rearing habitat for coho salmon. Riparian trees shade streams, reducing solar heating of the water, provide woody debris, and drop insects and debris that contribute to the food supply. In the Shasta River vegetation has been reduced for a variety of reasons.

Solution: Increase riparian vegetation.

ShastaHM-4a Encourage riparian restoration projects using locally native vegetation, including both woody and herbaceous stocks. Project implementation should consider if:

a. The site previously supported riparian vegetation and still has the soil and hydrologic characteristics to support it;

b. Native plants selected are likely to flourish;

c. The width of the planted riparian zone is appropriate for the hydrologic regime at the site; and

d. The plan includes effectiveness monitoring using approved protocols.

Short-term: Continue riparian planting efforts. Identify natural processes that encourage riparian vegetation recruitment. Establish working relationship/MOU with entities such as U.C. Davis, Humboldt State University, USFS, NRCS, the Society for Ecological Restoration, etc. to investigate specifics, test alternatives, and develop broad adaptive management approach. Evaluate outcomes of replanting and research causes of riparian planting outcomes, appropriate width of planted areas, and new strategies for restoration.
Long-term: Continue

Shasta HM-4b Establish procedures for recommending appropriate plant materials where natural conditions are significantly compromised and local species are not likely to thrive.
Short-term: Do search for information on similar conditions elsewhere. Where undocumented, or where realistic remediation does not exist, prepare presentation materials for publication and discussion at restoration conferences (see EO-8). Seek to establish a working group from industry, academia and government to identify specific problem conditions, determine if they can be reduced, or suggest alternative species compatible with local conditions if they cannot be remediated.
Long-term: Coordinate this discussion with considerations on instream flows, future role of Dwinnell Dam, TMDL temperature targets, fine sediment monitoring in spawning gravels.

Shasta HM-4c Educate the public and landowners on the importance of not removing riparian vegetation. See also EO-9.
Short-term: Prepare presentation materials with photos, illustrating desired future condition. Create awards and recognition. Because this is primarily an urban problem, work closely with Yreka Creek Committee to develop approach.
Long-term: Secure ongoing funding for periodic reminders and recognition.

Shasta HM-4d Investigate the establishment of a riparian easement or lease program to compensate landowners for short-term or long-term protection of their riparian property.
Long-term: Create opportunity, then gauge acceptability of program from local landowners response. Review the Buckhorn Conservancy. Find or develop a local entity or process to implement program.
Long-term: Monitor; utilize adaptive management of program.

8.2.4.5 Water Temperature

Issues: Water temperatures are influenced by the amount of river flow, river structure (W/D ratios, etc.), air temperature, shading from terrain and vegetation, influx of groundwater, tributary flow and runoff, and other factors. Water temperature is listed as a significant problem for the Shasta River (303d impaired). High water temperatures can stress coho salmon, increasing disease and mortality.

Solutions: Address factors that contribute to high water temperatures. Modeling water temperature and flow relationships in the mainstem will help plan for water management and habitat restoration in the river.

Shasta HM-5a Continue to model the relationship of temperature and flow. Use that information and other habitat variables to plan for water management and habitat restoration in the river.
Short-term: Fund development of more scenarios to cover a broader array of flows to run through the model. Coordinate with the NCRWQCB in TMDL process.
Long-term: Use model result to target restoration projects. Expand model to include the rest of the watershed.

Shasta HM-5b Identify location, timing, frequency and duration of thermal barriers to migration for adult and juvenile coho salmon. Develop habitat improvement measures that address temperature.
Short-term: Identify and map locations and timing of thermal barriers. Coordinate information and projects to address appropriate solutions in prioritized areas with the most benefit to coho salmon.
Long-term: Implement projects or measures in coordination with over-all habitat recovery process and monitor for improvements in an adaptive fashion.

8.2.5 WATER USE EFFICIENCY RECOMMENDATIONS

The overall goals for the water use efficiency recommendations are to:

- Promote water conservation by all water users (both for irrigation and stock water), particularly ***during low-flow years.***
- Promote and assure leaving water savings in the streams.
- Prioritize projects by recognized benefit to coho salmon; conduct cost-benefit analyses, including analysis of watershed volume and the effectiveness of the efficiency program for benefits to coho salmon.
- Research and promote incentives for the efficient use of water, including tax incentives.

8.2.5.1 Stock Water Alternatives

Issues: Active surface diversion for livestock watering in the post-irrigation season may reduce instream flows at a critical time for migrating adult coho salmon.

Solutions: Provide and maintain alternate stock watering facilities through voluntary, incentive-based programs.

WUE-1a	Develop the cost and potential stream-flow enhancement if all relevant diversions participated. **Short-term:** Coordinate with implementation of WUE-1b.
WUE-1b	Where water losses appear to be significant or where associated benefits can be demonstrated for coho salmon (e.g., fencing of riparian areas), identify and provide alternative stock water systems. **Short-term:** Identify and reprioritize systems needed by Dec 31, 2003. Design approach to individual systems; seek funding. **Long-term:** Install selected systems by Sept. 30, 2007.
WUE-1c	Provide improved awareness of needs for fish protection through the non-irrigation season and provide information about costs and benefits of stock-watering alternatives. **Short-term:** Provide education about management changes under ESA.

8.2.5.2 Landowner Workshops

Issues: Water users may lack awareness about the advantages and methods of water use efficiency, including alternate stock-watering methods.

Solutions: Educate water users and develop incentives for their participation in water-use efficiency programs.

WUE-2	Promote and provide landowner workshops. Work with landowners to develop a method to prioritize efficiency improvements that will yield either increased instream flows or improved water quality. Use to avoid funding projects that would not benefit coho salmon. See also EO-2. **Short-term:** Evaluate and provide education as appropriate.

8.2.5.3 Ditch Lining and Piping

Issues: Water losses from surface ditch systems may lead to more water being diverted than is needed at the point of use.

Solutions: Identify the advantages and water savings of lining and or piping surface ditch systems. Identify and prioritize ditch systems that have potential water saving benefits to coho salmon. Research possible negative effects to habitat, wildlife, and aquifer recharge from lining and or piping ditches.

WUE-3	Identify water savings from lining and/or piping surface ditch systems. Identify and prioritize ditch systems that have potential water-saving

benefits to coho salmon. Develop locally specific policies and provide guidance to entities that fund and review these projects. Evaluate potential negative impacts to groundwater, wildlife, and other resources that could result from lining or piping ditch systems. If appropriate, concurrently implement companion planned winter recharge program to maintain system balance.
Short-term: Map all existing ditches, show season of use, quantity, and determine ditch loss. Prioritize potential ditch lining projects. Collect field data if needed. Consider opportunity for assured, measurable increase in quantity and duration instream flows in spring and fall relative to coho salmon needs for passage, other criteria as developed. Utilize outreach funds to develop appropriate lining projects, especially on shared ditches. Implement where costs, benefits and overall basin priorities coincide.
Long-term: Continue implementation of high priority projects.

8.2.5.4 Ditch Repair and Cleaning

Issues: Lack of ditch maintenance can cause sustained high diversion rates and resulting flow impacts to coho salmon.

Solutions: Promote routine and on-going ditch maintenance. Research funding opportunities and incentives for ditch repair and cleaning.

WUE-4 Promote routine and on-going ditch maintenance for ditches in active use. See also EO-2,
Short-term: Educate landowners about the importance of maintaining ditch in active use and the possible need for access for maintenance activities.
Long-term: Continue education. Discuss purchase of water right if its beneficial use will not support the cost of maintaining its delivery system.

8.2.5.5. Irrigation System Efficiency

Issues: Inefficient irrigation systems cause loss of water and potential impacts to both flow and water quality.

Solutions: Promote incentives for irrigators to upgrade and maintain the efficiency of existing irrigation systems where there is a benefit to coho salmon.

WUE-5a Evaluate irrigation systems for water use efficiency with assistance from UC Extension Service, NRCS Farm Irrigation Rating Index Model (FIRI) or other available resources (Flood vs. wheel lines vs. pivots and conversion to low-pressure sprinkler systems).
Short-term: Develop prioritization approach for possible projects. Consider soil type, impacts on water quantity and quality, measurable benefits to coho salmon in terms of instream flow or water quality improvement.
Long-term: Implement projects only where benefits to coho salmon can be demonstrated and secured.

WUE-5b Promote maintenance of existing sprinkler systems, such as: replacing gaskets and drains; replacing nozzles and/or heads with crop-specific equipment. Implement education program through UC Extension.

WUE-5c Develop/disseminate Best management Practices (BMPs) for each irrigation type (including land leveling) and a corresponding on-farm monitoring system that is easily useable by farmer (e.g., moisture sensors to verify BMP). Encourage UC Extension to serve as a clearinghouse for the data and to evaluate success of the program.

WUE-5d Review existing water delivery pricing arrangements within irrigation districts to see if they are as effective as possible at encouraging efficient use of water.
Short-term: Conduct an economic study to look at current pricing systems, suggest revenue neutral changes that would enhance conservation and/or dedication to instream flows. Present to each district for consideration and possible action.

WUE-5e Support DWR in implementing the California Irrigation Management Information System (CIMIS) stations that measure evapotranspiration information and make it available over the internet to aid farmers in efficiently irrigating.
Short-term: Site and install stations, take steps to make information available to irrigators. Hold training programs to show utility.

8.2.5.6 Cropping Changes

Issues: Lack of stream flows influenced by diversion can impact coho salmon habitat. Certain crops or practices may not be the most efficient use of water.

Solutions: Research and suggest voluntary changes in cropping or practices that reduce water consumption and / or improve yield.

WUE-6a Research and suggest voluntary cropping changes that reduce water consumption and/or improve yield.
Short-term: Prepare a document reviewing all known crops capable of being grown commercially in this area, showing yield/acre likely, current market price, water requirements, growing season. For any that look promising in terms of water consumption, do further assessment of barriers to their use, including difference in return per acre vs. existing crops, marketing hurdles, processing hurdles, equipment processing and storage hurdles, and market limitations.
Long-term: Implement if feasible. Periodically review and update crop review document. If deemed feasible, partner with other producers throughout the watershed as appropriate; establish guidelines verification and marketing processes. If mechanical barriers are identified to otherwise promising potential changes, develop plan to address those hurdles if local producers can be encouraged to show interest. Where barriers are primarily economic, develop an approach that could subsidize conversion by willing producers.

WUE-6b Seek more marketing assistance and begin investigation of promoting local processing plants, thereby allowing people to transition to lower water use crops and to gain more income from value added options. Investigate

opportunities to embark on strategy of "salmon safe" product marketing as a way to boost value of otherwise economically non-competitive crops or growing procedures.
Short-term: Seek needed assistance; develop a plan to promote project; implement with County support; investigate RAC funding for processing plant options. If deemed feasible, partner with other producers throughout the watershed as appropriate; establish guidelines verification and marketing processes.

WUE-6c Launch a project to take advantage of changing opportunities in the beef industry for niche markets, which can provide greater financial returns and possible water savings as a result of the value-added option.
Short-term: Develop a workshop model that addresses risk involved in starting a niche-oriented business; production flow and related issues; product marketing; pricing; applicable State and federal regulations. Proceed with implementing workshops and making available marketing and other support to carry out the program.
Long-term: Implement this project concurrently with efforts to establish local processing plants.

8.2.5.7 Tailwater Reclamation

Issues: Tailwater (agricultural runoff) may negatively impact coho salmon and coho salmon habitat by returning water that is nutrient rich and/or high temperature.

Solutions: Tailwater return systems can provide beneficial impacts and water conservation opportunities.

WUE-7a Conduct basin-wide assessment of irrigation practices to identify opportunities to improve water use efficiency in order to reduce tailwater creation. Identify areas of tailwater inputs that cannot be reduced by improved irrigation practices.
Short-term: Conduct assessment. Coordinate with TMDL process.
Long-term: Prioritize remedial measures identified in assessment

WUE-7b Research and promote methods and opportunities to first minimize and then reclaim tailwater where it can be justified and is legally permissible. Priority should be given to shared systems.
Short-term: Provide agricultural engineering assistance to evaluate irrigation practices, soil depth, costs, and other factors that affect creation of tailwater on a ranch-by-ranch basis. Provide an agricultural waiver to eliminate red tape and permitting hurdles that currently block construction of tailwater systems, while retaining assurances that conditions will not be made worse by system proposed. Formalize local review group and process to assure cost effectiveness and prevent collateral damage
Long-term: Develop more comprehensive plans to capture and re-use tailwater as efficiently as possible; e.g., possibly build larger systems addressing multiple owners, rather than a cascade of individual ponds.

WUE-7c Develop a comprehensive evaluation and ranking process to be adopted by funding sources to maximize benefits to coho salmon while minimizing negative impacts possible with tailwater management projects.
Short-term: Educate funders to understand complexity of this issue via

coho salmon process. Strongly advocate the development of a statewide evaluation process to achieve positive cost/benefit ratio with adequate understanding of effects on instream flows before funds are allocated. Same for federally funded projects. Implement.
Long-term: Refine and adaptively manage.

8.2.5.8 Agricultural Water Conservation Best Management Practices

Issues: Current farm operations may not employ agricultural BMPs.

Solutions: Develop Agricultural Water Conservation BMPs that meet the needs of local landowners, particular with respect to regulatory issues.

WUE-8 Develop Agricultural Water Conservation BMPs.
Short-term: Revive Resource Management Advisory Committee (RMAC)-type planning approach. Get stakeholder agencies (State and Federal) to work with agriculture to develop a BMP/Safe Harbor program.

8.2.6 PROTECTION RECOMMENDATIONS

This section contains recommendations that deal with barriers to passage and habitat Degradation.

Issues: Adult coho salmon migrate upstream and spawn during the winter months. Juveniles remain (rear) in the mainstem and tributary streams for one full year before they migrate downstream and out of the watersheds. Throughout the course of that year, there are many activities that take place that could minimize the production of coho salmon.

Solutions: Promote coho salmon recovery by minimizing the potential for entrainment in diversions, protection of riparian vegetation, land use planning and enforcement of existing regulations.

P-1 Screen all diversions in the known and potential range of coho salmon.
Short-term: Identify funding and complete on-going screening program within known and potential range of coho. Assess habitat that will be made accessible to coho after completion of scheduled projects. Coordinate between involved Federal and State Agencies, local and private entities to develop a prioritized list of any remaining unscreened diversions and action plans including designs.
Long-term: Deal with screen maintenance problems. Identify funding and complete ongoing screening program within the known and potential range of coho salmon. Establish verification procedures to assure that screens are properly installed and maintained by person(s) benefiting from use of the screened diversion. Support evaluation of and transition to less labor intensive designs to minimize future maintenance

P-2 Promote and encourage protection of riparian zones that are important for coho through fencing or other measures.

Short-term: All riparian areas within range of coho will be identified and protected within 5 years:

a. Identify and continue to develop incentive based programs (e.g., NRCS's CRP) for riparian protection zones. Develop GIS layer for accomplished and needed protection areas.

b. Limit funding to planting of trees from local native stock only.

c. Provide funding for greatly expanded tree re-planting program. Provide protection from beavers for remaining large trees along the Shasta River.

d. Provide public with visual aids and recognition of achievement of desired future condition.

e. Fund studies to solve regeneration problems, such as those found in the Shasta Valley that are caused by the altered hydrological cycle and those in the Scott Valley that are caused by the drop in groundwater level.

Long-term:

a. Develop long-range riparian protection goals statement and recommendations based on stream meander width (e.g., Rosgen et al.).

b. Continue to emphasize need to establish/protect/maintain desired conditions.

c. If the consequences of altered hydrograph in Shasta cannot be overcome with native trees, investigate and develop biologically appropriate recommendations.

P-3 Expand routine/ daily fish screen maintenance program (volunteer and paid) whether installed with grant funds or by the Department.
Short-term: Local groups to work with the Department and NOAA Fisheries to develop comprehensive maintenance program by 2005.

a. Work with screen users to develop inspection verification procedure for use after transition period.

b. Use time afforded by grant funds to transition away from non-owner screen maintenance and, where appropriate, transfer screen maintenance to the diverter.

c. Prepare maintenance manual, provide part names, numbers and sources, encourage local hardware or farm supply store to stock parts subject to wear, or make arrangements for the Department to stock and sell.

d. Use existing grant-funded personnel to assess existing screens (public and private) to identify all normally replaceable parts used, to modify screens where possible to standardize all parts possible, and prepare hardware lists of replacement parts and number of screens needing each.

Long-term: Long-term procedure should implement inspection/ verification, integrated with verification of water use described in WM-2. Provide periodic on-site training on proper screen maintenance and repair.

P-4 Evaluate fish rescue and relocation program. Make improvements if program is viable, and develop steps to minimize the need for rescue and relocation within 5 years.

Short-term: The Department to develop a fish rescue plan, which will include identification of areas of suitable habitat for all coho salmon life stages, trapping sites, release sites, responsible parties and effectiveness monitoring. Schedule any additional necessary field surveys, create GIS map of problem areas, assess causes of each, then develop list of actions needed to eliminate need for fish rescue.
Long-term: Work to solve problems responsible for rescue needs.

P-5 Develop construction and removal procedures or alternate means of diverting water for irrigation dams (gravel or flashboard) that minimize impacts to coho salmon.
Short-term:

a. Identify locations of existing structures, assess impacts to coho salmon, and recommend improvements to procedures and individual structure design. Work with diverters to implement these improvements. Determine timing of coho salmon emergence.

b. In Shasta, proceed to implementation phase, complete assessments. Eliminate passage problems wherever possible, install or replace ladders where necessary as short term fix.

c. Provide qualified Department engineer for design assistance in retrofitting barriers with ladders or correcting problems with locally produced and installed ladders as short term, temporary fix..

d. Develop BMPs for removal/ replacement/ operation, include these in 1603 process and monitor for effectiveness for both agriculture and fish.

Long-term: Work with other agencies to assure that additional barriers are not created in future. Eliminate or reduce passage problems where ladders were used as short-term solutions or mitigation. Fund experimental designs to test approaches under local field conditions.

P-6 Recommend that the County develop agricultural land use policies addressing coho salmon recovery actions, ideas and protections.
Short-term: Develop agricultural land use policies as appropriate to address coho salmon recovery actions, ideas and protections.
Long-term: Implement County agricultural land use policies as appropriate.

P-7 Recommend enforcement of existing laws, codes, regulations and existing court decrees that are relevant to coho salmon recovery
Short-term: Support adequate funding of agencies with enforcement authority. Develop outreach, information and education program specific to existing laws, codes, regulations and existing court decrees. Recommend to local Fish and Game Commission that fines go to recovery restoration efforts.
Long-term: Continue enforcement.

8.2.7 MONITORING AND ASSESSMENT RECOMMENDATIONS

These recommendations are divided into two categories, 1) habitat monitoring and assessment, which includes effectiveness monitoring for restoration actions, and the monitoring and assessment of coho salmon populations.

8.2.7.1 Monitoring and Assessment: Habitat

Issues: Monitoring and assessment actions are needed in both watersheds to identify and evaluate limiting factors for coho salmon, assist in the prioritization of management alternatives, and evaluate the implementation and effectiveness of individual restoration actions.

Solutions: The SSRT should seek to provide for physical access following acceptable protocols and agreements for community based organizations (SRWC, Shasta CRMP, SOSS) and public agencies (state, federal, local) to conduct monitoring and assessment activities. To maximize the cost effectiveness of monitoring and assessment work, activities in both HSAs should be closely coordinated with ongoing local and regional monitoring programs. Information collected should be grouped and aggregated for public release so that privacy is not violated and made available through web-based linkages and databases. To evaluate the effectiveness of individual restoration actions, funds should be provided to monitor changes in both habitat parameters and potential response by coho salmon following implementation.

MA-1	Where agricultural roads have a potential effect on coho salmon, conduct roads inventory and assessments including the location of fish barriers and sediment delivery potential. Monitor physical changes to aquatic resources through time. **Short-term:** Identify and prioritize sediment sources and passage problems for correction. **Long-term:** Implement remediation actions and monitor effectiveness over time. **Supports recommendations:** Habitat Management (HM-1b, HM-2e).
MA-2	Identify and assess riparian vegetation coverage and condition and monitor changes through time. **Supports recommendations:** HM-1-1c, HM-3b, HM-3d.
MA-3	Assess baseline physical habitat conditions including but not limited to channel structure, side channel (including beaver ponds), spawning gravel, riparian vegetation, habitat complexity/connectivity, large woody debris recruitment, and monitor changes in habitat quality and quantity including those associated with restoration activities. **Short-term:** Design and implement comprehensive assessment and monitoring incorporating protocols developed in statewide or regional monitoring programs **Long-term:** Continue implementation **Supports recommendations:** HM-1-1e, HM-2-1a, HM-2-1b, HM-4a, HM-4b, HM-2b, HM-2e, HM-3b, P-6, EO-8.
MA-4	Assess water quality/quantity parameters including but not limited to dissolved oxygen, pH, suspended sediment, temperature, turbidity, flow, hyporheic flow, nutrients/pollutants (agricultural return flows, pesticides, herbicides, wastewater) and monitor changes through time. Identify and assess point and non-point pollution sources (e.g., irrigation returns, sediment). Coordinate with the TMDL process. **Short-term:** Design and implement comprehensive assessment and monitoring incorporating protocols developed in statewide or regional

monitoring programs.
Long-term: Continue implementation.
Supports recommendations: WM-3a, WM-3b, WM-4a, WM-4b, WM-5b, WM-5c, WUE-5a, WUE-7a, HM-1-3b, HM-1-3d, HM-XXX (flow, HM-1b, HM-2e, HM-3b, HM-4a, P-6.

MA-5 Complete inventory and mapping of surface water diversions within the Scott and Shasta valleys.
Short-term: Complete study, including QA/QC.
Long-term: Incorporate into planning process.
Supports recommendations: HM-4a, P-1, P-5.

MA-6 Identify and assess effects of flood control levees on over-wintering and other habitat conditions for coho salmon and monitor habitat changes through time.
Short-term: Find ACOE and NRCS records of activity for both HAs. Determine effects of levee system.
Long-term: Determine feasibility; and develop and implement remediations based on results of assessments.

MA-7 Inventory, assess, and monitor effectiveness of water use efficiency/water conservation, water augmentation and water management projects expected to contribute to instream flow.
Short-term: Design and implement comprehensive monitoring program. Work with DWR to predict effectiveness of the various water-use efficiency and conservation practices in both valleys.
Long-term: Compile results and incorporate into planning.
Supports recommendations: WA-1a, WM-1a, WM-1b, HM-4-XXX (flow), WM-2c, WM-2e, WUE-5a, WM-3a, WM-3b, WM-5b, WM-5c.

MA-8 Inventory, assess, and evaluate instream habitat and riparian restoration project activities and BMPs and monitor effectiveness in improving habitat for coho salmon.
Short-term: Design and implement comprehensive assessment and monitoring incorporating protocols developed in statewide or regional monitoring programs. Make sure effectiveness monitoring is a component of future habitat improvement projects.
Long-term: Continue implementation and incorporate into future management plans or actions.
Supports recommendations: HM-1-1b, HM-1-1c, HM-2e.

MA-9 Inventory, evaluate, and monitor changes in land use practices over time including conversion from agriculture to other uses for impacts on coho salmon and their habitat.
Short-term: Collect baseline data.
Long-term: Evaluate and incorporate information into the County land use policy.
Supports recommendations: HM-2e, HM-4a.

MA-10 Conduct adult and juvenile current and potential carrying capacity estimates and monitor changes over time.
Short-term: Assess and estimate current and potential carrying capacity. Evaluate potential method for predicting carrying capacity.
Long-term: Apply abundance data to determine realization of carrying capacity.
Supports recommendations: WM-3a, WM-3b, WM-5b, WM-5c, WUE-5a, HM-4b, HM-1c.

MA-11 Conduct groundwater monitoring in support of the studies referred to in WM-10a and WM-10b.
Short-term: Support and expand coverage and frequency of current DWR and local group long-term monitoring. If ground water is used to supplement surface water for instream flows, monitor the effects on stream flows and well levels. Collect and distribute monitoring data from additional wells to establish groundwater contours
Long-term: Provide information to groundwater committee referred to in WM-10c. Continue long-term monitoring.
Supports recommendations: WM-10a, WM-10b.

8.2.7.2 Monitoring and Assessment: Coho Salmon Populations

Issues: Baseline information is needed on the distribution and abundance of coho salmon within both watersheds. Monitoring coho populations over time is necessary to determine long-term trends in abundance, evaluate the effectiveness of coho recovery actions and progress toward meeting recovery goals, and provide data to guide changes in management actions. Availability of baseline information is affected by the difficulty, due to high winter flows, of counting adult salmon.

Solutions: Work with the Department and other fisheries experts to develop and implement a program to monitor coho abundance and distribution within the Shasta Valley and Scott River HSAs. Integrate this program with existing regional and statewide monitoring efforts.

MA-12 Conduct limiting factors analysis and monitor changes through time by life stage for coho salmon.
Short-term: Identify additional data needs to complete both efforts.
Long-term: Develop management plans for remediation of limiting factors. Monitor effects to coho populations and habitat.

MA-13 Continue to identify the historic and current distributions of coho salmon adults and juveniles within the Scott River and Shasta Valley HSAs.
Short-term: Identify, evaluate, and map coho spawning and rearing habitat utilization areas and monitor changes through time.
Long-term: Monitor and analyze spatial structure and changes in distribution through time. Continue to implement and use results to modify monitoring protocols, and modify restoration techniques.
Supports recommendations: WM-3a, WM-3b, WM-4a, WM-4b, WM-5b, WM-5c, WUE-5a, HM-1-1a, HM-4a, HM-4b, HM-1a, HM-1b, HM-1c, P-1, P-5, P-6.

MA-14 Conduct adult and juvenile abundance estimates and monitor changes over time.
Short-term: Begin abundance surveys. Develop and implement statistical methodology for adult and juvenile salmon. Improve methods for counting adult salmon in Scott.
Long-term: Continue and improve abundance surveys. Use data to develop annual adult and emigrant abundance estimates for both valleys.
Supports recommendations: WM-3a, WM-3b, WM-5b, WM-5c, WUE-5a, HM-4b, HM-1c.

MA-15 Conduct analysis of juvenile growth rates and production estimates and monitor changes through time.
Short-term: Develop and implement a comprehensive study plan with appropriate agencies.
Long-term: Continue studies and apply results as appropriate.
Supports recommendations: WM-3a, WM-3b, WM-5b, WM-5c, WUE-5a, HM-1c.

MA-16 Conduct standard measurements of trapped spawners and carcasses.
Short-term: Develop egg production estimates and spawner age distribution.
Long-term: Apply data via appropriate agencies.

MA-17 Identify adult and juvenile diversity (genotypic/phenotypic) variations within the Scott and Shasta rivers for comparisons with other populations within the Southern Oregon-Northern California ESU.
Short-trem: Coordinate with state and federal agencies in collection of tissues.
Long-term: Make both phenotypic and genotypic data available to appropriate agencies and public.

MA-18 Food availability: conduct macro-invertebrate assessments and monitor changes through time.
Short-term: Expand studies and analyze results.
Long-term: Apply results as appropriate.

MA-19 Assess effectiveness of fish rescue program through monitoring survival of rescued fish
Short-term: Support the Department's effort to monitor and assess the survival of the rescued fish.
Long-term:. Provide assistance in monitoring fish survival.
Supports recommendation: P-4.

8.2.7.3 Cooperative Efforts

During implementation, groups active in the effort should coordinate with other assessment and monitoring programs, such as:

Department of Fish and Game/NOAA Fisheries:

Restoration Effectiveness Monitoring and Protocol Development Project
Restoration Validation Monitoring and Protocol Development Project
California Coastal Salmonid Monitoring Plan
Steelhead Research and Monitoring Program (SRAMP)
State (CESA)/Federal (ESA) Recovery Planning

Other State Agencies:

Department of Water Resources (DWR)
North Coast Regional Water Quality Control Board (NCRWQCB)
—TMDL (sediment, temperature, nutrients)

Other Federal Agencies:

Aquatic Resource and Ecological Monitoring Program (AREMP)
Natural Resources Conservation Service (NRCS)
Environmental Protection Agency (EPA)

Local/Regional Entities:

Resource Conservation Districts
Five Counties Salmonid Conservation and Road Program

Academic Institutions:

University of California Cooperative Extension
Humboldt State University
UC Berkeley/Davis
Institute for Forest and Watershed Management (IFWM)

8.2.8 EDUCATION AND OUTREACH RECOMMENDATIONS

Issues: 1) Coho salmon recovery cannot succeed without buy-in from local people. Education and outreach can help landowners and members of the public understand why restoring coho salmon and their habitat is worthwhile, and how they can help. 2) To improve funding opportunities for restoration, education must also be targeted towards agency and elected officials at the state and national levels, to inform them about local efforts and successes in the Shasta and Scott Valleys. Participation of lead organization(s) may be contingent upon obtaining necessary funding.

Solutions: Use events, workshops, and various forms of media to encourage changes in attitudes and behavior that enhance coho salmon recovery. Seek and procure sources of funding where needed.

EO-1	Use existing extension services to inform landowners of funding programs for water conservation, fish habitat restoration, and BMPs. **Short-term:** Advertise available funding sources, assist landowners in identifying projects for support (based on SWRT recommendations), provide grant writing resources/ training. Monitor extension effectiveness (# projects funded, # projects implemented) on a routine basis. **Long-term:** Expand extension efforts to include all interested landowners. Insure that all priority projects are funded. Continue to monitor extension effectiveness.
EO- 2	Sponsor land stewardship training courses (e.g., ranch planning, road maintenance, alternative stock watering system development and maintenance, irrigation ditch maintenance, and water use efficiency, prioritizing activities that tangibly increase instream flows and improve water quality). **Short-term:** Implement local-adapted land stewardship courses. **Long-term:** Expand locally adapted land stewardship courses and monitor their effectiveness.
EO-3	Fund demonstration projects on land with public access, showing fish-friendly BMPs (e.g., fish-safe use of pesticides / herbicides) and associated agricultural innovations. **Short-term:** Identify locations for demonstration projects. Undertake integrated restoration efforts at these sites. Organize tours to visit these demonstration projects. Organize tours of successful demonstration projects in other watersheds, to gain inspiration.

Long-term: Continue to improve demonstration projects, while developing an active research program to assess demonstration project effectiveness.

EO-4 Use available outreach resources to inform landowners about existing riparian easement or lease programs and how to participate in them.
Short-term: Contact landowners and help them identify how riparian easements can assist them in achieving land management objectives. Identify funding sources to help compensate landowners for establishing and maintaining riparian easements.
Long-term: Expand outreach efforts throughout the Shasta and Scott Valleys.

EO-5 Enhance funding for school systems to continue and expand watershed and fisheries education (examples of activities already done in Siskiyou County: aquarium incubators in classrooms; a riparian plant nursery; student participation in spawning survey data gathering).
Short-term: Increase participation in current programs, and expand them to other agencies and communities. Evaluate program effectiveness and revise as necessary.
Long-term: Review overall effectiveness of on-going programs and revise as necessary. Create new watershed and fisheries education programs.

EO-6 Develop and distribute widely an informational brochure explaining coho salmon life history, habitat requirements, and both its historic and recent distribution.
Short-term: Develop this brochure and print 10,000 copies.
Long-term: Revise and reprint the brochure as needed.

EO-7 Develop and distribute widely a newsletter describing current fisheries restoration efforts, as well as how the public can become involved.
Short-term: Publish a newsletter (15,000 copies) that is inserted into local newspapers once every six months, beginning in late summer/fall 2003.
Long-term: Continue to publish a newsletter at least once a year.

EO-8 Develop and distribute an informational brochure describing plant species recommended for riparian restoration, emphasizing the use of native plant species and matching species to specific stream-bank conditions. Causes of past riparian planting failures and remedies to these will be discussed.
Short-term: Consult past and continuing local riparian restoration programs to gather information about riparian species nursery management, restoration site selection, outplanting, and plant protection. Use this information to develop the brochure.
Long-term: Monitor riparian restoration project effectiveness (e.g., plant survival, increased cover, lowered water temperatures, improved bank stabilization, and then revise and reprint the brochure as needed.

EO-9 Develop and distribute a publication targeting non-agricultural landowners that highlights the importance of not removing riparian vegetation, and the beneficial role of large woody debris in properly functioning streams.
Short-term: Publish an annual newsletter (1,000 copies) and distribute via local, state and Federal agencies. Offer incentives to participate in riparian protection / enhancement programs (free workshops on riparian restoration, free riparian species seedlings, etc.). Provide recognition and awards to exemplary non-agricultural land-owners, highlighting their riparian protection/restoration efforts. Coordinate with the Yreka Creek Committee in designing complementary riparian protection programs.
Long-term: Continue to publish a newsletter at least once a year. Expand

initiatives that enhance protection and recovery of riparian areas, especially where beneficial to coho salmon.

EO-10 Based on a literature review of beaver-salmon interactions, publish a brochure to educate the public about the impacts of beavers and their dams on coho salmon and coho salmon recovery.
Short-term: Review beaver-salmon interaction literature to provide a basis for brochure content.
Long-term: Revise and republish brochure as necessary.

EO-11 Produce a locally oriented fish-friendly road and stream care handbook for free distribution.
Short-term: Develop this handbook and print 1,000.
Long-term: Update every two years, or as needed.

EO-12 Produce a brochure targeted at prospective landowners, real estate agents, and title companies that describes adjudicated water rights, irrigation ditch easements, and the requirements/responsibilities associated with them. The brochure should emphasize that access to ditches with easements must be granted to allow for ditch maintenance and repair.
Short-term: Develop this brochure and print 200 copies.
Long-term: None

EO-13 Recruit local media and media personalities to inform the public about restoration efforts. Develop and submit Opinion-Editorial pieces related to local coho salmon restoration efforts/issues.
Short-term: Interview local people spearheading fish restoration efforts for radio, newspapers, and cable TV. Do this quarterly.
Long-term: Continue to produce interviews and reports for local radio, newspapers, and cable TV every three months.

EO-14 Use media professionals to create informational videos that are local in context, to be shown to schools, service clubs, county fair-goers, etc.
Short-term: Shoot informational video during 2003-2004 (during all four seasons). Edit video during latter portion of 2004. Begin using video in early 2005.
Long-term: N/A

EO-15 Establish a web site with coho salmon biology information, up-to-date restoration grant funding, and examples of projects. Ask local websites to provide a link to this coho salmon site.
Short-term: Create website and make operational by the end of 2003. Provide for monthly website maintenance and updates.
Long-term: Continue to maintain and update website monthly.

EO-16 Develop an informational PowerPoint presentation on coho salmon recovery and provide this to local groups (service organizations, county fair, local extension offices, etc.).
Short-term: Develop PowerPoint presentation, send to other agencies/groups for review, then revise and distribute.
Long-term: Update every two years, or as needed.

EO-17 Establish contacts and organize events that bring resource-dependent people from throughout the Klamath Basin together, and that foster communication, friendship, and cooperation.
Short-term: Organize an event/gathering that people throughout the Klamath Basin might want to attend (SSRT brainstorming needed).

Long-term: Continue to organize basin wide gatherings regularly, and publicize these gatherings widely.

EO-18 Organize an annual coho salmon festival, inviting the general public. Put on a mini version of this festival at the county fair, to help advertise the event.
Short-term: Select an optimal season (fall?) and date, and organize an salmon festival.
Long-term: Continue to organize annual salmon festivals.

EO-19 Provide the public with information about the California Irrigation Management Information System (CIMIS).
Short-term: Produce CIMIS informational materials for circulation through a variety of media.
Long-term: Update CIMIS informational materials every two years and re-circulate.

EO-20 For each of the Shasta and Scott watersheds, organize a quarterly forum for exchange of information between parties collecting data, conducting research, and implementing restoration projects on the ground. These meetings will be open to the public.
Short-term: Organize quarterly Shasta and Scott Watershed meetings.
Long-term: Continue to organize quarterly meetings.

EO-21 Produce quarterly Congressional Briefings (state and Federal).
Short-term: Each briefing should summarize recent fish run trends, projects funded/ completed, projects recently applied for, upcoming project applications, and pressing issues.
Long-term: Continue to submit quarterly Congressional Briefings.

EO-22 Conduct tours for media, legislators State and Federal), schools, public, and others to show coho salmon and habitat recovery efforts.
Short-term: Organize tours during summer, late fall (during coho salmon run), and spring.
Long-term: Continue to organize tours, as necessary.

8.3 ADMINISTRATION AND IMPLEMENTATION

Acceptance of the Shasta-Scott Pilot Program by the local agricultural community is inextricably linked to development of a programmatic implementation framework which covers normal ranching and farming activities consistent with the Pilot Program. The Department is committed to working with the SSRT to develop this framework. This framework should include necessary Streambed Alteration Agreements for water diversion and other instream work, as well as coverage for any unavoidable incidental take of coho salmon or other listed species.

The implementation schedule is dependent on funding. Implementation costs for some recommendations proposed by the SSRT have been categorized as high, moderate or modest. For many other SSRT recommendations, no attempt was made to estimate costs due to lack of information or uncertainties regarding project scope or timing. It is therefore not possible to make even a crude estimate of overall restoration costs at this time.

Historically, funding for salmon restoration has been available from a variety of sources including state and federal agencies and from various restoration grant opportunities with cost sharing by local landowners. The current economic downturn and State budget crisis could jeopardize funding from one or more of these sources. The Department recognizes that adequate funding is essential to successful implementation of the Pilot Program.

The Department is committed to working with the SSRT, other state and federal agencies, and with various interest groups to ensure the Shasta-Scott Pilot Program is implemented in an economically reasonable manner with an equitable apportionment of public and private obligations. The Department continues to believe that an incentive-based approach to implementation is the most viable option for agricultural areas of the Shasta and Scott valleys.